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⑥ MECHANICAL APTITUDE II

DESCRIPTION OF GROUP TESTS

by Thelma Gwinn Thurstone and L. L. Thurstone

DDC

AUG 20 1964

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THE PSYCHOMETRIC LABORATORY
THE UNIVERSITY OF CHICAGO

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DDC FILE

GROUP TEST BATTERY

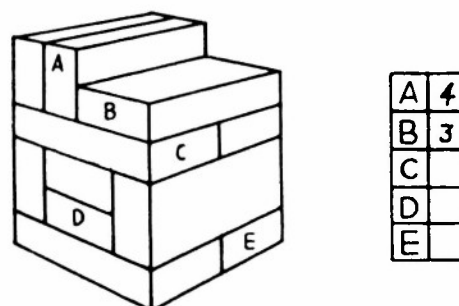
The tests comprising the Group Test Battery are described in the following manner. The tests are arranged in the order in which they appear throughout the statistical analysis of test results. The nature of the task will be explained by the use of a sample problem as is done in the fore-exercise. This will be followed by a practice item taken from the latter part of the test. The correct answers for this practice problem will be given. The time limits used in administering the test will be given followed by the scoring method used. A frequency distribution of raw scores and the reliability determined by split half scoring completes the test description.

TEST 1

BLOCK COUNTING

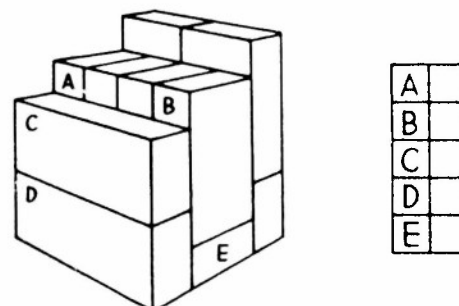
The example at the right represents an orderly pile of blocks, all of which are of the same size and shape. The task is to count the blocks which touch each of the lettered blocks, and to indicate that number in the table at the right. Thus, four blocks touch block A, three blocks touch block B, etc. Go right ahead and work the remaining three items.

You should have written 7 beside C, 5 beside D, and 4 beside E.



At the right is another practice problem. Go right ahead and determine how many blocks touch each of the lettered blocks. Indicate your answer by writing the number of blocks touching each lettered block opposite the proper letter in the table at the right.

You should have written 6 beside A, 6 beside B, 5 beside C, 6 beside D, and 6 beside E.



Number of items: Sixteen piles of blocks with five items each, making a total of eighty items.

Time limits: Fore-exercise 6 minutes
 Test proper 10 minutes

Scoring method: Score is number of correct items. Scoring formula: $S = R$.

Frequency chart: Class interval of 5, $N = 313$.

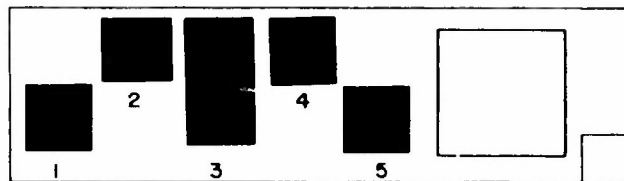
Score	From To	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
		4	9	14	19	24	29	34	39	44	49	54	59	64	69	74	79
Frequency	f	0	1	4	7	6	17	20	27	50	39	39	41	35	16	8	3

Test reliability: $R_{11} = .96$.

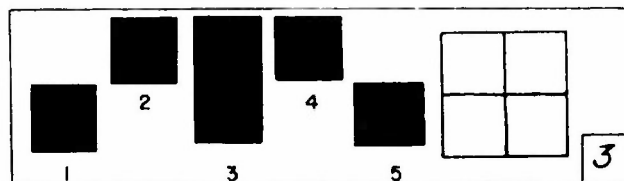
TEST 2

PAPER PUZZLES

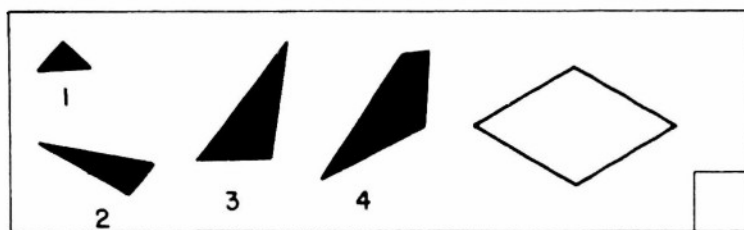
Look at the drawing at the right. The large white square can be made of pieces like the black pieces, 1, 2, 4, and 5. There is one piece left over. There may be other ways to make the square, but there must be only one piece left over.



The solution to the example is shown at the right. Lines are sketched in the square to show that pieces 1, 2, 4, and 5 are used. A figure 3 has been written in the small square in the lower right hand corner to show that piece 3 is not used.



Below is a practice problem. If you can find the answer without sketching lines in the figure, you may do that. It may help you to sketch the lines in. Only the correctness of the numbers in the small squares is counted in the scoring.



A figure 1 should have been written in the small square.

Number of items: Thirty items.

Time limits: Fore-exercise 3 minutes
Test proper 9 minutes

Scoring method: The score is the number of items correctly solved minus one third of the number marked incorrectly. Scoring formula: $S = R - W/3$.

Frequency chart: Class interval of 2, $N = 338$.

Score	From	0	2	4	6	8	10	12	14	16	18	20	22	24	26
To		1	3	5	7	9	11	13	15	17	19	21	23	25	27
Frequency	f	0	6	9	30	32	50	62	49	47	28	20	2	2	1

Test reliability: $R_{11} = .68$.

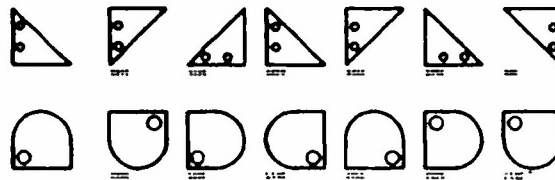
TEST 3

CARDS

A sample item is shown below. The task is to decide which cards of the six on the right can be made the same as the card on the left by sliding the cards around in the plane of the paper. The second and third cards on the right are the only ones that can be made like the card on the left. The left card cannot be made to fit the other four by sliding it around on the page. The cards which are the same as the one at the left have been indicated by blackening the spaces between the dotted lines under those cards.



Here are two more sample problems. In each row mark every card that is like the first card in the row.



In the first row you should have marked the second, third and sixth cards, and in the second row you should have marked the first, third and fifth cards.

Number of items: Twenty rows with six items each, making a total of 120 items.

Time limits: Fore-exercise 2 minutes
Test proper 5 minutes

Scoring method: Considering only those items marked by the subject, the score is the number right minus the number wrong. Scoring formula: $S = R - W$.

Frequency chart: Class interval of 5, $N = 307$.

Score	From	0	5	10	15	20	25	30	35	40	45	50	55
	To	4	9	14	19	24	29	34	39	44	49	54	59
Frequency	f	0	5	11	19	35	41	55	58	27	25	24	7

Test reliability: $R_{11} = .95$.

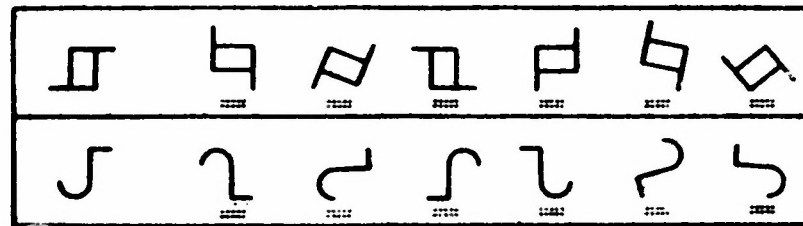
TEST 4

FIGURES

A sample item is shown below. The task is to decide which figures of the six on the right can be made the same as the figure on the left by sliding the figures around in the plane of the paper. The first and fifth figures on the right are the only ones which can be obtained in this way, so they are marked by blackening the space between the dotted lines under them. None of the other four figures on the right are like the figure at the left. They are made backward.



Below are two more examples to be worked in the same way. Mark every figure which is like the first figure in the row. Do not mark the figures which are made backward.



In the first row you should have marked the first, fifth and sixth figures on the right. In the second row you should have marked the third and sixth figures on the right.

Number of items: Twenty rows of figures with six items in each row, making a total of 120 items.

Time limits: Fore-exercise 2 minutes.
Test proper 5 minutes

Scoring method: Considering only those items which are marked by the subject, the score is the number right minus the number wrong. Scoring formula: $S = R - W$.

Frequency chart: Class interval of 5, $N = 306$.

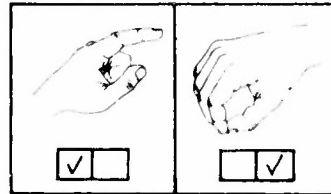
Score	From To	0	5	10	15	20	25	30	35	40	45	50
		4	9	14	19	24	29	34	39	44	49	54
Frequency	f	8	3	8	17	18	30	51	35	36	51	49

Test reliability: $R_{11} = .96$.

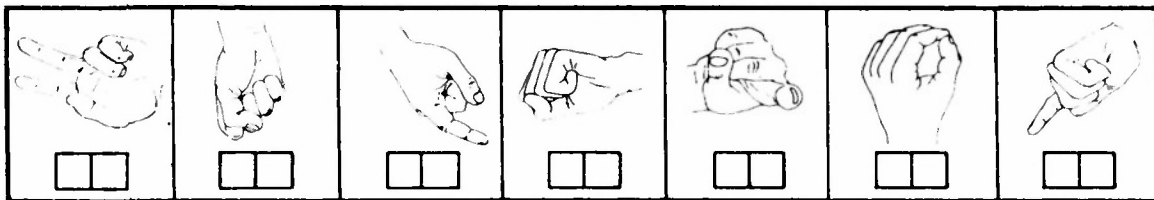
TEST 5

HANDS

In this test you will be shown a series of pictures of hands. Some of these pictures represent right hands, others represent left hands. Below each picture you will find two small squares. If the picture represents a right hand put a check mark in the right square; if it represents a left hand put a check mark in the left square. The following samples have been correctly marked.



Go right ahead and mark the following samples in the same way.



You should have checked the squares for each picture as follows: left, right, right, left, right, left, and left.

Number of items: Forty-nine items.

Time limits: Fore-exercise 4 minutes
Test proper 3 minutes

Scoring method: Score is number of items right minus number wrong. Scoring formula:
 $S = R - W$.

Frequency chart: Class interval of 3, $N = 338$.

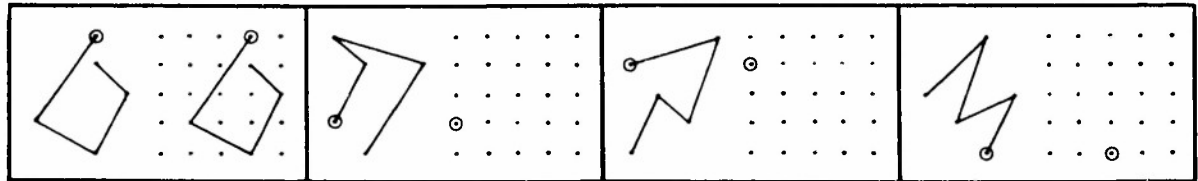
Score	From	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48
	To	2	5	8	11	14	17	20	23	26	29	32	35	38	41	44	47	50
Frequency	f	4	13	10	11	11	18	30	22	25	23	31	18	23	19	24	39	17

Test reliability: $R_{11} = .92$.

TEST 6

COPYING

In this test you are to copy each of the figures in the dotted space to the right of it, starting with the circled dot. There is a dot for every corner. In the examples below, the first one has been worked out for you. Go right ahead and copy each of the other figures in the space to the right of it.



Each copied figure should have the same size, shape and position as the figure from which it was copied.

Number of items: Thirty-six items.

Time limits: Fore-exercise 3 minutes
Test proper 6 minutes

Scoring method: Score is number of drawings correctly reproduced. Scoring formula: $S = R$.

Frequency chart: Class interval of 2, $N = 335$.

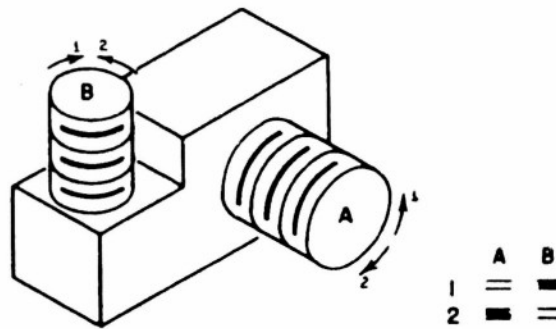
Score	From To	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36
		1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37
Frequency	f	2	3	13	12	23	28	42	32	35	26	27	21	25	18	8	6	6	7	1

Test reliability: $R_{11} = .94$.

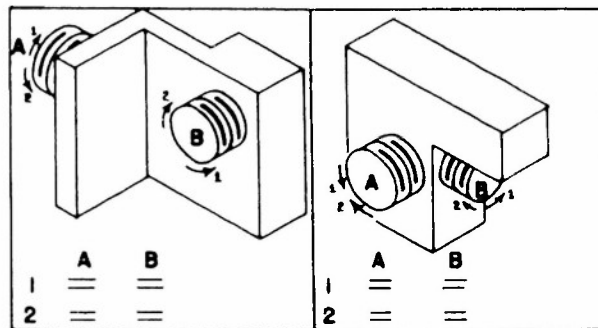
TEST 7

BOLTS

In the sample item below you are to decide in which direction each bolt should be turned to screw it into the block. All bolts have right hand threads. Bolt A should be turned in the direction of arrow number 2 in order to drive it further into the block, so the space marked 2 under A has been blackened. The space marked 1 under B has been blackened, indicating that bolt B must be turned in the direction of arrow number 1 to screw it into the block.



Go right ahead and do the examples below in the same way. Remember that all bolts have right hand threads.



In the first example you should have marked space 2 under A and space 2 under B. In the second example you should have marked space 2 under A and space 2 under B.

Number of items: Sixteen blocks with two bolts each and sixteen blocks with three bolts each, making a total of eighty items.

Time limits: Fore-exercise 3 minutes
 Test proper 4 minutes

Scoring method: Score is number of items right minus number wrong. Scoring formula:
 $S = R - W$.

Frequency chart: Class interval of 5, N = 330.

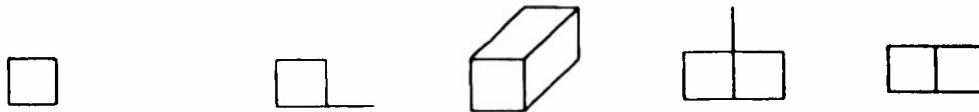
Score	From To	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70
		4	9	14	19	24	29	34	39	44	49	54	59	64	69	74
Frequency f		14	5	24	16	32	31	35	50	39	33	22	19	4	2	4

Test reliability: $R_{11} = .93$.

TEST 8

GOTTSCHALDT FIGURES

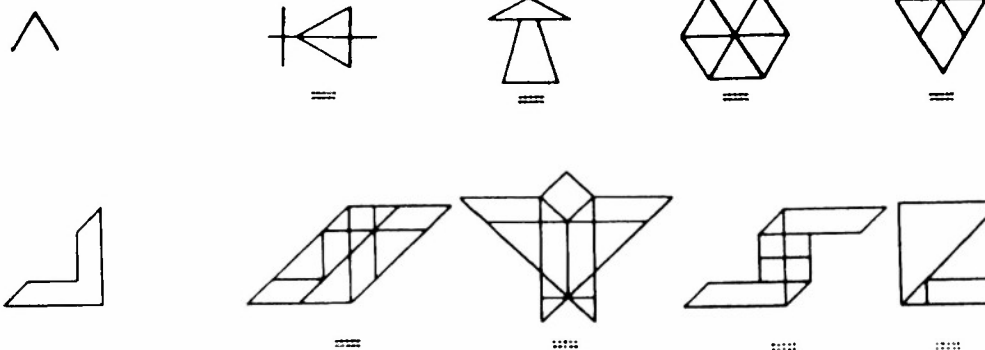
Look at the row of drawings below. The design at the left is hidden in each of the drawings to the right of it. See if you can find the square in each of the four drawings on the right.



The design must be in the same position in the drawing as it is at the left. In the row of drawings below two of the drawings contain the design. These two drawings are marked. The other two drawings are not marked because they do not contain the design.



In each of the next two rows you are to mark the spaces under the drawings which contain the design at the left of the row.



You should have marked the last two drawings in the first row, and the first and third drawings in the second row.

Number of items: Eighteen rows with four items each, making a total of seventy-two items.

Time limits: Fore-exercise 4 minutes
Test proper 5 minutes

Scoring method: Score is number of items right minus number wrong. Scoring formula:
 $S = R - W$.

Frequency chart: Class interval of 4, N = 335.

Score	From	0	4	8	12	16	20	24	28	32	36	40	44	48	52	56
	To	3	7	11	15	19	23	27	31	35	39	43	47	51	55	59
Frequency f		14	11	17	25	29	33	58	43	43	32	14	11	2	2	1

Test reliability: $R_{11} = .78$.

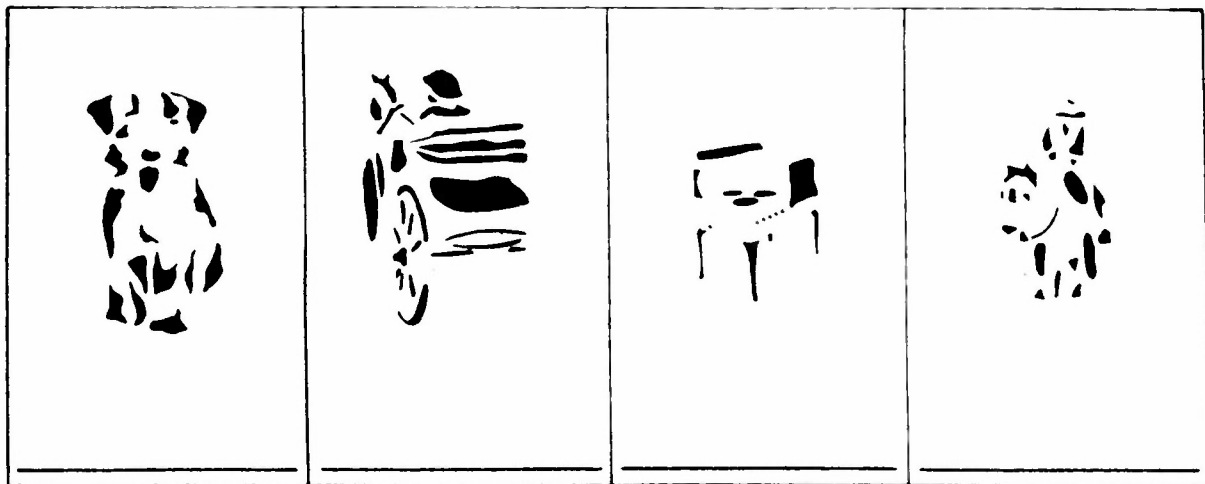
TEST 9

STREET GESTALT COMPLETION TEST

Look at the figure below. It is a picture of a sailboat, so the word sailboat has been written under it.



Identify the following pictures by writing their names under them.



The first picture shows a dog, the second is a horse and buggy, the third is a kitchen stove, and the fourth is a horse and rider.

Number of items: Twenty-four items.

Time limits: Fore-exercise 1 minute
Test proper 3 minutes

Scoring method: Score is number of correctly identified items. Scoring formula: $S = R$.

Frequency chart: Class interval of 1, $N = 333$.

Score	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Frequency	1	2	5	7	13	17	23	36	46	53	43	35	23	16	6	4	2	1

Test reliability: $R_{11} = .68$.

TEST 10

MUTILATED WORDS TEST

Look at the word house. It has been printed twice, but the second time part of each letter has been erased. Since the word is house, it has been written on the line.

house

house house

Identify each mutilated word by writing it on the line at the right. The first word has been identified.

football football

kitchen _____

stove _____

The second word is kitchen, and the third is story.

Number of items: Twenty-six items.

Time limits: Fore-exercise 2 minutes
Test proper 4 minutes

Scoring method: Score is number of items correctly identified. Scoring formula: $S = R$.

Frequency chart: Class interval of 1, $N = 338$.

Score	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Frequency	2	5	9	11	8	13	19	22	24	28	31	32	41	41	21	14	8	8	0	1

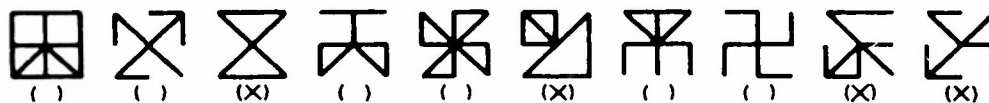
Test reliability: $R_{11} = .80$.

TEST 11

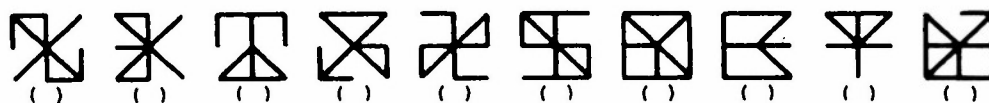
DESIGNS

Look at the "model" design at the right and then try to find this "model" in each of the designs below. The "model" must always be in the position shown at the right. The third, sixth, ninth, and tenth figures in the row below contain the "model," so an X has been placed under each of these designs.

"Model"

In the following row indicate in the same way those designs which contain the "model."



You should have marked the second and fourth designs, and only these two, since they are the only designs which contain the "model."

Number of items: Three hundred items, of which only forty contain the "model."

Time limits: Fore-exercise 2 minutes
Test proper 4 minutes

Scoring method: Score is number of items marked which are right. Scoring formula: $S = R$.

Frequency chart: Class interval of 2, N = 318.

Score	From	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39
	To	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
Frequency f		2	4	9	3	8	16	11	20	23	18	35	40	30	31	17	19	9	11	12

Test reliability: $R_{11} = .97$.

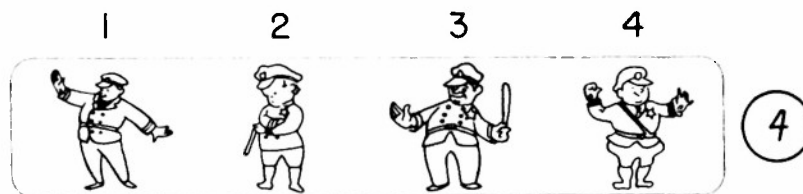
TEST 12

MEMORY FOR PICTURES

In this test a series of pictures is projected one at a time on a screen. Each picture is shown for a short time only. This is a sample picture.

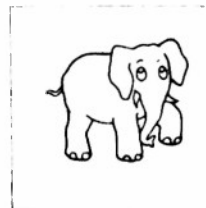


Below is a sample row of the answer booklet. The number 4 has been written in the circle at the right of the row to show that the fourth picture is the same as the sample picture above.

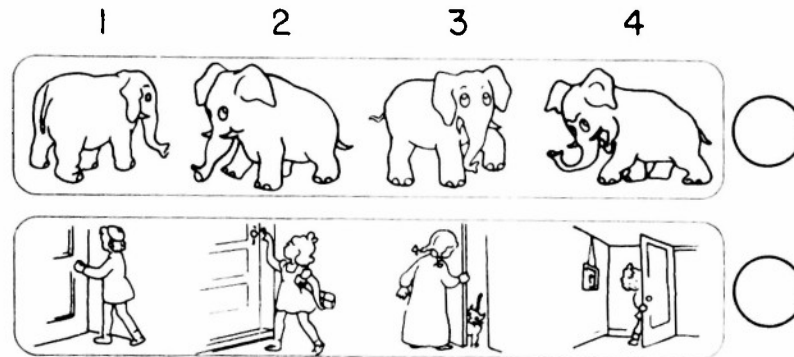


There is one row in the answer booklet for each stimulus picture presented on the screen. One and only one picture in each row of the answer booklet is exactly like one of the stimulus pictures presented.

The two pictures at the right are taken from the series of eighty-four projected stimulus pictures. All eighty-four pictures are shown before any subject opens his answer booklet.



Below are the two rows of the answer booklet which correspond to these two stimulus pictures. Indicate which picture in each row is like one of the stimulus pictures by writing the number of that picture in the circle at the right of the row.



In the two examples above, the number 3 should have been written in the circle for the first row and the number 1 in the answer circle for the second row.

Number of items: Eighty-four items.

Time limits: The screen exposure time for each stimulus picture is five seconds. The total testing time is approximately fifteen minutes.

Scoring method: Score is number of items correctly marked. Scoring formula: $S = R$.

Frequency chart: Class interval of 3, $N = 321$.



Score	From	42	45	48	51	54	57	60	63	66	69	72	75	78	81
	To	44	47	50	53	56	59	62	65	68	71	74	77	80	83
Frequency f		2	0	2	5	9	19	25	41	40	53	42	45	25	13

Test reliability: $R_{11} = .82$.

TEST 13

VISUAL MEMORY

In this test sets of five frames like the following set are flashed on a screen consecutively, one frame at a time. The following set is set number 1 in the test. The first frame in the set is a warning signal. The second frame shows an irregularly shaped figure. The third frame is blank. The fourth frame shows another irregularly shaped figure. In some of the sets the fourth frame is exactly like the second, while in other sets the fourth frame is different from the second. The task is to decide, after the fourth frame in each set has been shown, whether the two figures that have been shown are the same or different, and to indicate the answer by circling on an answer sheet the letter S or D, respectively, in the row indicated by the fifth frame. Row 1 of the answer sheet is shown below the set. The letter D in row 1 has been circled to indicate that the two figures of set 1 are different.

Ready				Mark the answer in row 1.
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1. S (D)

Number of items: Fifty items.

Time limits: The screen exposure time for each slide is five seconds. The total testing time is approximately twenty minutes.

Scoring method: Score is number of correct items minus the number of incorrect items.

Scoring formula: $S = R - W$.

Frequency chart: Class interval of 4, $N = 312$.

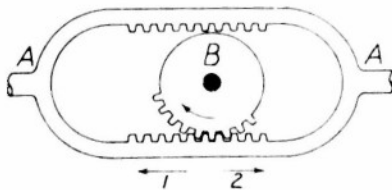
Score	From	0	4	8	12	16	20	24	28	32	36	40	44	48
	To	3	7	11	15	19	23	27	31	35	39	43	47	51
Frequency f		1	0	0	2	7	20	21	41	53	65	56	42	4

Test reliability: $R_{11} = .64$.

TEST 14

MECHANICAL MOVEMENTS

In this test the task is to answer questions about the mechanical movements that are pictured. In each picture, the part that makes the others move is called the driver. The solid black circles represent axles which can turn, but cannot move from where they are shown. Now read each question after the picture below. Put a mark under the correct answer at the right. The correct answer to the first question has been marked.



1. If B starts moving in the direction shown, which way will A move?

1 2

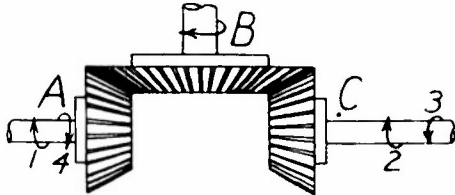
2. In which direction will A be moving when B has turned half way around from where it is now?

1 2

You should have placed a mark under the figure 2 in the second question above.

Here is another set of questions for you to answer about the picture shown below.

A, B, and C are three bevelled gears.



1. If A is turning in direction 1, which way is C turning? 2 3
2. If B is turning in the direction shown, which way is A turning? 1 4
3. If B is turning in the direction shown, which way is C turning? 2 3

You should have placed a mark under 3 in question one, under 1 in question two, and under 3 in question three.

Number of items: Sixty-six items.

Time limits: Fore-exercise 3 minutes
Test proper 20 minutes

Scoring method: So that all scores will be positive, the score is number of items right minus number wrong, plus twenty. Scoring formula: $S = R - W + 20$.

Frequency chart: Class interval of 5, $N = 322$.

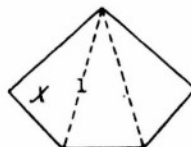
Score	From	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
	To	4	9	14	19	24	29	34	39	44	49	54	59	64	69	74	79
Frequency f		2	5	5	30	55	43	54	43	35	21	14	8	4	1	1	1

Test reliability: $R_{11} = .76$.

TEST 15

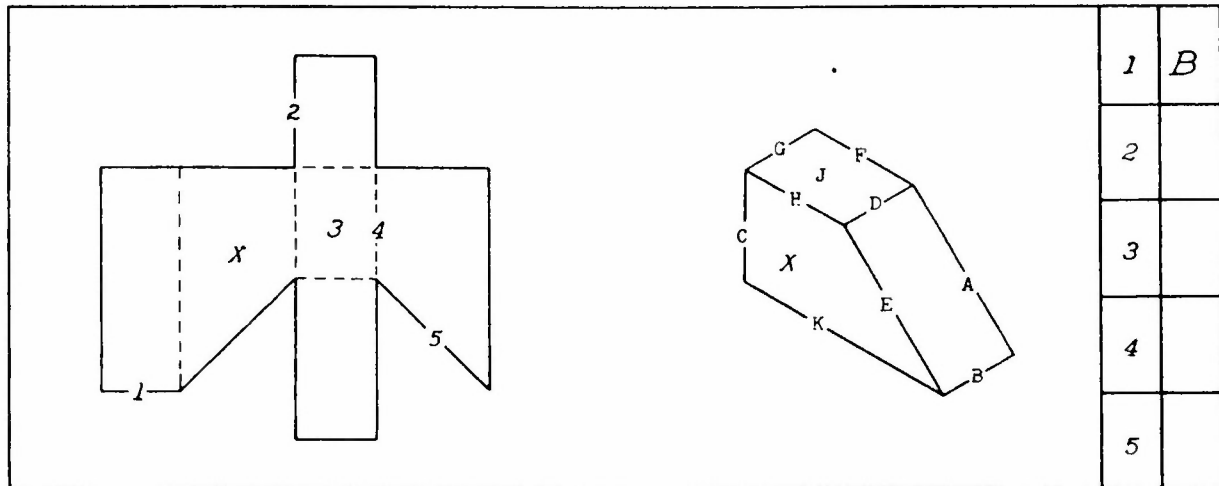
SURFACE DEVELOPMENT

Look at the two drawings below. The drawing on the left is a flat piece of paper which can be folded on the dotted lines to form the solid figure on the right. The paper should be folded so that side X is in the position shown in the solid figure.



When the paper is folded in this way, where will the dotted line 1 be in the solid figure? It will be edge C of the solid figure.

The paper pattern below can be folded to make the solid figure at the right so that side X is in the position shown in the solid figure. If this is done, where will the edges and side marked by the numbers be in the solid figure? Indicate your answers by writing the letters in the spaces at the right. Number 1 is already correctly marked.



You should have written C beside 2, J beside 3, F beside 4, and A beside 5.

Number of items: Twelve surface developments with five items each, making a total of sixty items.

Time limits: Fore-exercise 2 minutes
Test proper 14 minutes

Scoring method: Score is number of correct items. Scoring formula: $S = R$.

Frequency chart: Class interval of 4, $N = 336$.

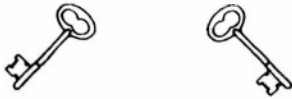
Score	From	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
	To	7	11	15	19	23	27	31	35	39	43	47	51	55	59	63
Frequency	f	8	21	29	33	39	39	37	27	22	22	21	12	13	11	2

Test reliability: $R_{11} = .96$.

TEST 16

REVERSALS AND ROTATIONS

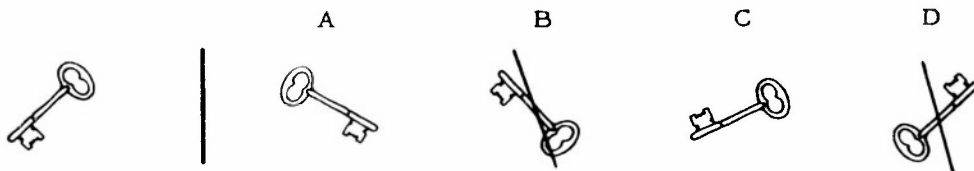
These two keys are exactly alike.



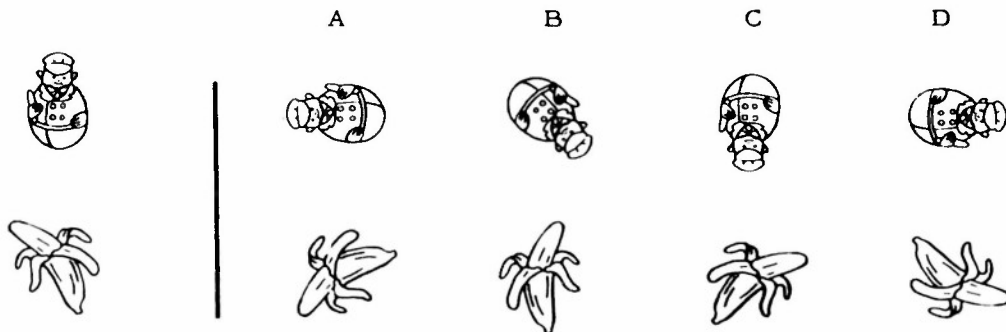
These two keys are not exactly alike.
The pictures are reversed.



In the row of keys below, B and D are exactly like the first picture in the row. They have been marked.



In the two rows of pictures below, mark every picture that is exactly like the first picture in the row.



In the first row you should have marked B. In the row of bananas you should have marked A and D.

Number of items: Thirty rows of four items each, making a total of 120 items.

Time limits: Fore-exercise 2 minutes
Test proper 7 minutes

Scoring method: Score is number marked which are correct minus number marked which are incorrect. Scoring formula: $S = R - W$.

Frequency chart: Class interval of 5, N = 335.

Score	From To	0 4	5 9	10 14	15 19	20 24	25 29	30 34	35 39	40 44	45 49	50 54	55 59
Frequency	f	7	12	26	44	55	55	43	27	27	28	7	4

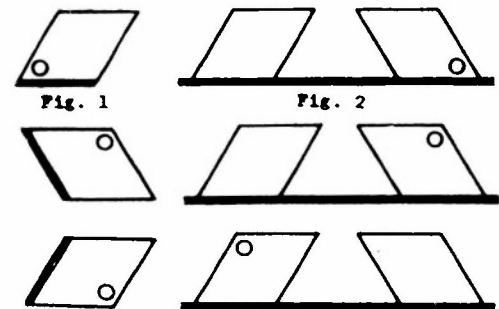
Test reliability: $R_{11} = .94$.

TEST 17

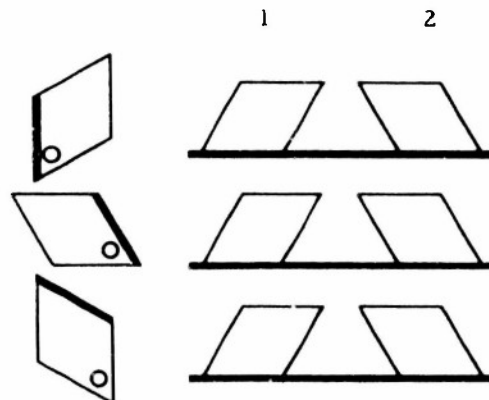
LOZENGES A

Figure 1 represents a lozenge-shaped card. It has a hole in one corner. It is painted black on one edge. Imagine that it is picked up, turned over, and placed face down so that the black edge touches the long black line in figure 2. Decide which of the two diagrams it would fit. Where would the hole be? It is shown in figure 2.

In each of the other two sample problems imagine that the card is picked up, turned over, and placed face down so that the black edge touches the long black line. Decide which of the two diagrams it would fit and where the hole would be. In each of these examples a small circle has been drawn to show where the hole would be.



For each of the accompanying problems decide which of the two diagrams the card would fit when it has been turned over, and draw a small circle to show where the hole would be.



You should have drawn a small circle in the lower left corner of card 1 in the first example, in the lower right corner of card 2 in the second example, and in the upper right corner of card 1 in the third example.

Number of items: Forty-eight items.

Time limits: Fore-exercise 10 minutes
Test proper 5 minutes

Scoring method: Score is number right minus number wrong. Scoring formula: $S = R - W$. This is different from the previous scoring formula for this test, which counted the score as being the number right.

Frequency chart: Class interval of 3, $N = 305$.

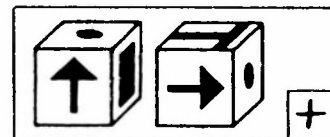
Score	From	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48
	To	2	5	8	11	14	17	20	23	26	29	32	35	38	41	44	47	50
Frequency f		49	18	12	23	18	18	16	20	24	12	6	16	16	16	11	14	16

Test reliability: $R_{11} = .96$.

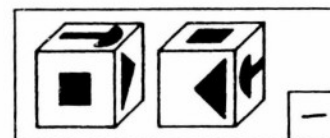
TEST 18

CUBES

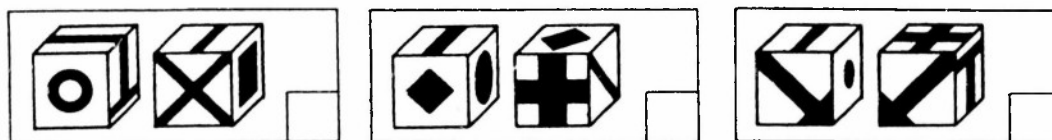
The drawings in this test represent cubes. A cube has six faces. There is a different design on each face of any one cube. Notice that both the drawings at the right can represent the same cube, only turned in two different directions. Since both drawings can represent the same cube, a plus sign (+) has been placed in the square at the right.



Notice that the two drawings at the right represent two different cubes and that a minus sign (-) has been placed in the blank square. Be sure you see clearly that the two drawings cannot represent the same cube.



Work the following practice problems in the same way. Remember that there is a different design on each face of a cube.



The first two cubes could not be the same, the second set of two cubes could be the same cube, and the third set could not be the same cube. Therefore the answers should be minus, plus, and minus, in that order.

Number of items: Forty-four items.

Time limits: Fore-exercise 9 minutes
Test proper 6 minutes

Scoring method: Score is number right minus number wrong. Scoring formula: $S = R - W$.

Frequency chart: Class interval of 2, $N = 307$.

Score	From	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36
	To	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37
Frequency f		17	9	23	16	18	28	26	43	23	17	17	20	12	12	8	10	4	1	3

Test reliability: $R_{11} = .78$.

TEST 19

IDENTICAL FORMS

This is a test of perceptual speed. The first figure in each line below is exactly the same as one of the five numbered figures following. In the blank space at the right of each line write the number of the figure which is exactly the same as the first figure in the line. The first two blank spaces have been filled in correctly. Go right ahead and work the next three examples.

	1	2	3	4	5	
						1
						3

The correct answers are 4, 2, and 5, in that order.

Number of items: Sixty items.

Time limits: Fore-exercise 3 minutes
Test proper 5 minutes

Scoring method: Score is number of correct items minus one fourth of incorrect items. Scoring formula: $S = R - W/4$.

Frequency chart: Class interval of 2, N = 330.

Score	From	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
	To	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59	61
Frequency	f	1	1	0	4	7	9	5	11	19	14	32	45	29	33	24	17	26	32	21

Test reliability: $R_{11} = .96$.

TEST 20

MUTILATED PICTURES

In this test you will see pairs of pictures which were originally the same. However, in each pair some part of one of the pictures has been erased. For every pair you are to mark the picture which has something missing. In the example below, picture A has been marked since one of the fish in picture A has been erased.



In the following two problems, place a mark through each picture that has had some part erased.



For the pair on the left you should have marked B since one of the presents in B has been erased. For the pair on the right you should have marked A since one of the hands of the clock in A has been taken out of the picture.

Number of items: Thirty-six items.

Time limits: Fore-exercise 2 minutes
Test proper 4 minutes

Scoring method: Score is number of items correctly marked minus number of items incorrectly marked. Scoring formula: $S = R - W$.

Frequency chart: Class interval of 2, $N = 332$.

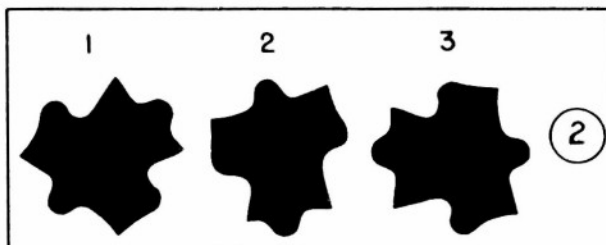
Score	From	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32
	To	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33
Frequency f		1	2	6	12	42	55	63	55	45	15	20	6	8	1	1

Test reliability: $R_{11} = .80$.

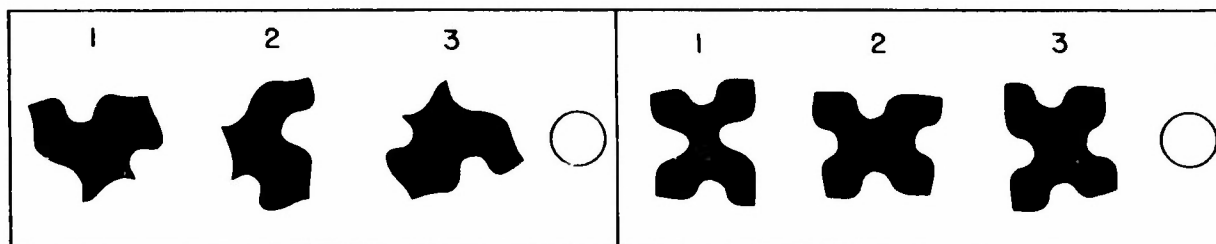
TEST 21

JIG-SAW PIECES

Of the three figures in the row below, two are exactly alike in shape, while one is slightly different. You are to decide which figure is different, considering only shape and not position. In the example below, the second figure is different from the other two, and so the number 2 has been written in the circle at the right.



Here are two more practice problems. In each problem find the figure which is different and write the number of that figure in the small circle at the right of the row.



You should have written 2 in the circle for the first example, and 1 in the circle for the second example.

Number of items: Forty-eight items.

Time limits: Fore-exercise 2 minutes
 Test proper 7 minutes

Scoring method: Score is number of items correctly marked minus one half the number of items incorrectly marked. Scoring formula: $S = R - W/2$.

Frequency chart: Class interval of 3, $N = 330$.

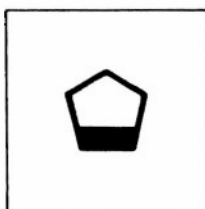
Score	From	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42
	To	2	5	8	11	14	17	20	23	26	29	32	35	38	41	44
Frequency f		8	15	20	36	41	60	43	40	26	14	10	6	7	3	1

Test reliability: $R_{11} = .84$.

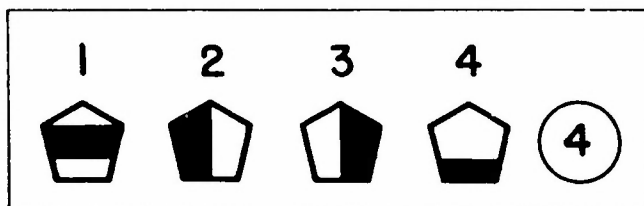
TEST 22

MEMORY FOR GEOMETRIC DESIGN

In this test a series of geometric designs is projected one at a time on a screen. Each design is shown for a short time only. This is a sample design.

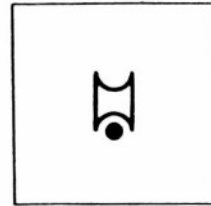
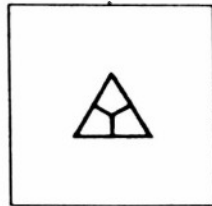


Below is a sample row of the answer sheet. The number 4 has been written in the circle at the right of the row to show that the fourth design is the same as the sample design above.



There is one row on the answer sheet for each stimulus design presented on the screen. One and only one design in each row of the answer sheet is exactly like one of the stimulus designs presented.

The two pictures below are taken from the series of twenty-four projected stimulus designs. All twenty-four designs are shown before any subject turns over his answer sheet.



Below are the two rows of the answer sheet which correspond to these two stimulus designs. Indicate which design in each row is like one of the stimulus designs by writing the number of that design in the circle at the right of the row.

1	2	3	4	

In the two examples above, the number 2 should have been written in the circle for the first row and the number 1 in the answer circle for the second row.

Number of items: Twenty-four items.

Time limits: The screen exposure time for each stimulus picture is five seconds. The total testing time is approximately seven minutes.

Scoring method: Score is number of items correct. Scoring formula: $S = R$.

Frequency chart: Class interval of 2, $N = 325$.

Score	From To	0	2	4	6	8	10	12	14	16	18	20	22	24
		1	3	5	7	9	11	13	15	17	19	21	23	25
Frequency f		3	1	3	0	14	24	30	29	76	36	77	20	12

Test reliability: $R_{11} = .73$.

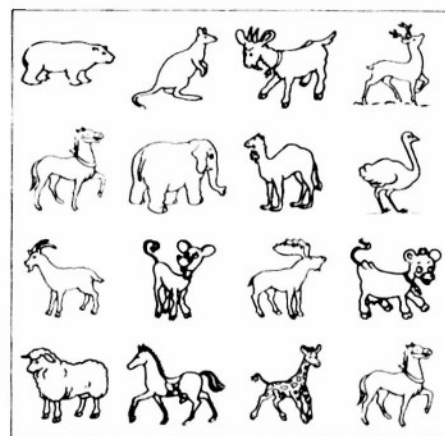
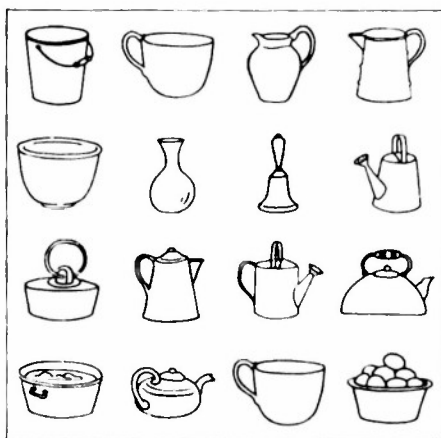
TEST 23

PICTURES SQUARES

The square below contains sixteen pictures, only two of which are exactly alike. The task is to find those two pictures which are exactly alike and cross them out. This has been done in the example below.



Now work the two problems below by crossing out the two pictures which are exactly alike.



In the first example you should have crossed out the two teacups. In the second example you should have crossed out the two horses without saddles.

Number of items: Eighteen items.

Time limits: Fore-exercise
Test proper

1 minute
4 minutes

Scoring method: Score is number of items correct. Scoring formula: $S = R$.

Frequency chart: Class interval of 1, $N = 321$.

Score	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Frequency	3	3	1	6	16	26	32	29	39	40	33	28	28	20	11	6

Test reliability: $R_{11} = .81$.

TEST 24

LETTER SERIES

In the first series of letters below, the letter c should come next, and so this letter has been marked in the answer row at the right. In the second series of letters below, the next letter should be e, and so e has been marked in the answer row. In the third series, the next letter should be i, and so i has been marked in the answer row at the right.

c d c d c d	a <u>b</u> c d e f
a a b b c c d d	a <u>b</u> c d e f
a b x c d x e f x g h x	h i <u>j</u> k x y

Now study the series of letters below. In each series decide what the next letter should be and mark that letter in the answer row at the right.

a a a b b b c c c d d	a <u>b</u> c d e f
a x b y a x b y a x b	a <u>b</u> c x y z
a b m c d m e f m g h m	g h i <u>j</u> m n
r s r t r u r v r w r x r	r s t w x y
a b c d a b c e a b c f a b c	a b c f g h

For the five examples above, you should have marked d, y, i, y, and g, in that order.

Number of items: Thirty items.

<u>Time limits:</u> Fore-exercise	4 minutes
Test proper	5 minutes

Scoring method: Score is number of items correct. Scoring formula: $S = R$.

Frequency chart: Class interval of 2, N = 308.

Score	From	2	4	6	8	10	12	14	16	18	20	22	24	26	28
	To	3	5	7	9	11	13	15	17	19	21	23	25	27	29
Frequency f		7	6	12	26	31	43	46	41	32	24	21	10	5	4

Test reliability: $R_{11} = .94$.

TEST 25

LETTER GROUPING

In each row of letters below, three of the groups of letters are alike in some way, while one group is different. The task is to decide, for each row, which one of the four groups is different, and to mark that group by blackening the space between the dotted lines under it. In the first row the fourth group does not contain three A's, as do the other three groups, and so the fourth group has been marked. In the second row three of the groups are in reversed alphabetical order, but the third group is not, and so it has been marked. In the third row the first three groups are in alphabetical order, omitting one letter, while the fourth group omits two letters, and so the fourth group has been marked.

AAAB	AAAM	AAAR	AATV
DCBA	HGFE	MRUX	PONM
ABCE	FGHJ	KLMO	RSTW

In each row below, three of the groups of letters are alike in some way. Mark the one that is different.

ABCP	CBAQ	ABCR	ABCS
DCCJ	DBBJ	DNNJ	DRSJ
CXYZ	CFGH	DPQR	CLMN

You should have marked the second group in the first row, the fourth group in the second row, and the third group in the third row.

Number of items: Thirty items.

<u>Time limits:</u> Fore-exercise	3 minutes
Test proper	5 minutes

Scoring method: Score is number of items correct minus one third of the number of items which are incorrect. Scoring formula: $S = R - W/3$.

Frequency chart: Class interval of 2, $N = 335$.

Score	From	4	6	8	10	12	14	16	18	20	22	24	26	28	30
	To	5	7	9	11	13	15	17	19	21	23	25	27	29	31
Frequency	f	1	6	12	17	25	40	71	70	48	29	6	8	1	1

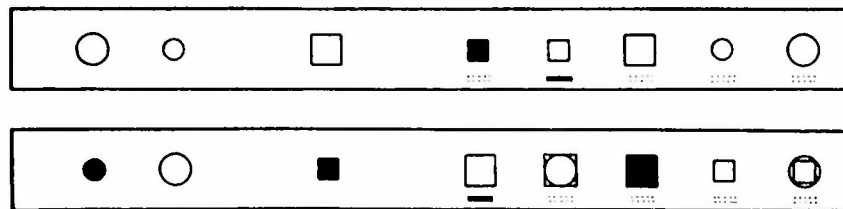
Test reliability: $R_{11} = .83$.

TEST 26

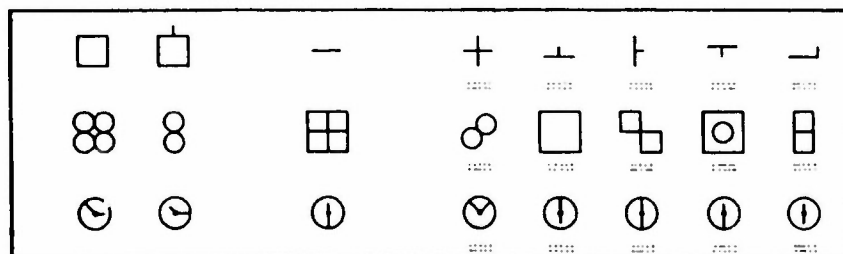
FIGURE ANALOGIES

In the first example below, the first figure is a large circle. The second figure is a small circle. The first figure is changed to make the second by the rule, "making it smaller." The task is to apply this rule to the third figure and to mark the resulting figure in the answer row at the right. The small square in the answer row is marked to show that it is the answer.

In the second example below, the first figure is changed to make the second by the rule, "making it of the opposite color and larger." Applying this rule to the third figure, we get the large white square in the answer row, and so the large white square has been marked.



Notice that the rule changes from one problem to another. In the examples below you are to decide what rule is used to change the first figure to the second, apply this rule to the third figure, and mark the resulting figure in the answer row at the right.



In the answer rows of the practice problems you should have marked the second, fifth, and second figures, respectively.

Number of items: Thirty items.

Time limits: Fore-exercise 3 minutes
Test proper 5 minutes

Scoring method: Score is number of items correct minus one-fourth of the number of items which are incorrect. Scoring formula: $S = R - W/4$.

Frequency chart: Class interval of 2, $N = 320$.

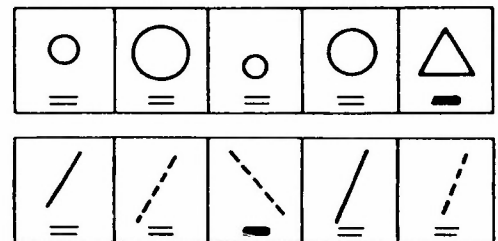
Score	From	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28
	To	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29
Frequency f		6	5	4	2	9	6	21	23	42	75	55	45	19	7	1

Test reliability: $R_{11} = .82$.

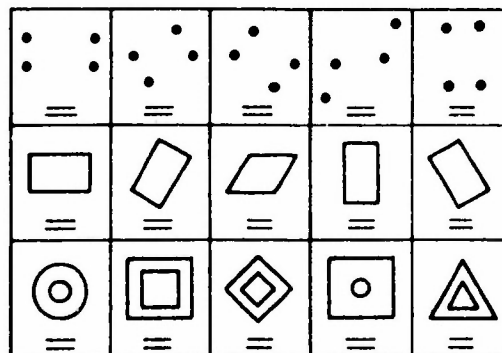
TEST 27

FIGURE GROUPING

In the first row of drawings at the right, four of the drawings are circles while one is a triangle. The triangle has been marked because it is not like the other figures in the row. In the second row at the right, four of the drawings are alike in some way. One drawing is different. The third drawing is different from the others because it is the only line that slopes down to the right. It has been marked.



In each row of drawings below, four of the five figures have something in common. Put a mark under the one which is different.



You should have marked the fourth figure in the first row, the third figure in the second row, and the fourth figure in the third row.

Number of items: Thirty items.

<u>Time limits:</u>	Fore-exercise	3 minutes
	Test proper	4 minutes

Scoring method: Score is number of items correct minus one-fourth of the number of items which are incorrect. Scoring formula: $S = R - W/4$.

Frequency chart: Class interval of 1, $N = 330$.

Score	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Frequency	1	0	4	1	6	4	11	7	18	23	21	25	46	41	37	21	19	27	13	5

Test reliability: $R_{11} = .66$.

The last five tests in this battery were taken from United States Navy tests and will not be described in detail here because of their "Restricted" classification. For these tests the name of the test will be given and the Navy test or tests from which the items were taken will be listed. The time limits and scoring methods used and the distribution of raw scores and test reliabilities obtained will be given also.

TEST 28

MECHANICAL COMPREHENSION - BOOK I

This test contains items selected from the following United States Navy tests:

1. Winchmen and Hatchmen Selection Test - Form X-1; NAVPERS - 16584
2. Officer Qualification Test - Form 2; NAVPERS - 16561
3. Mechanical Aptitude Test - Fleet Edition - Form X-2, 1945
4. Officer Qualification Test - Form 3; NAVPERS - 16563
5. Mechanical Aptitude Test - Form 3; NAVPERS - 16527, 1944
6. Mechanical Aptitude Test - Form 1; NAVPERS - 16520, 1943
7. Mechanical Aptitude Test - Form X-3; NAVPERS - 16526, 1944
8. Mechanical Aptitude Test - Form 2; NAVPERS - 16524, 1943
9. Officers Mechanical Aptitude Test - Form X-1; NAVPERS - 16640, 1944

Number of items: Fifty items.

<u>Time limits:</u>	Fore-exercise	4 minutes
	Test proper	20 minutes

Scoring method: Score is number of correct items. Scoring formula: $S = R$.

Frequency chart: Class interval of 3, N = 334.

Score	From	6	9	12	15	18	21	24	27	30	33	36	39	42	45
	To	8	11	14	17	20	23	26	29	32	35	38	41	44	47
Frequency	f	1	8	28	38	67	63	54	29	15	14	9	3	3	2

Test reliability: $R_{11} = .77$.

TEST 29

ROTATION OF SOLID FIGURES

This test was taken in whole from the Winchmen and Hatchmen Selection Test, Form X-1; NAVPERS - 16584.

Number of items: Fifteen items.

Time limits: Fore-exercise 2 minutes
Test proper 3.5 minutes

Scoring method: Score is number of items correct minus one-fourth of the number of incorrect items. Scoring formula: $S = R - W/4$.

Frequency chart: Class interval of 1, N = 311.

Score	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Frequency	2	0	6	9	14	21	28	29	41	38	28	41	26	21	6	1

Test reliability: $R_{11} = .74$.

TEST 30

BLOCK ASSEMBLY

This test was taken from the Officers Mechanical Aptitude Test, Form X-1; NAVPERS - 16640, 1944.

Number of items: Thirty items.

Time limits: Fore-exercise 2 minutes
Test proper 11 minutes

Scoring method: Score is number of items correct minus one-third of the number of incorrect items. Scoring formula: $S = R - W/3$.

Frequency chart: Class interval of 2, N = 334.

Score	From	0	2	4	6	8	10	12	14	16	18	20	22	24
	To	1	3	5	7	9	11	13	15	17	19	21	23	25
Frequency	f	11	10	19	36	23	68	41	55	33	22	6	9	1

Test reliability: $R_{11} = .66$.

TEST 31

MECHANICAL EXPERIENCE

The items for this test were taken from the following United States Navy tests:

1. Mechanical Knowledge Test - Form X-2; NAVPERS - 16532, 1943
Part I - Tool Relationships
2. Mechanical Knowledge Test - Form 2; NAVPERS - 16533A, 1943
Part I - Tool Relationships
3. Mechanical Knowledge Test - Form 3; NAVPERS - 16535A, 1944
Part I - Tool Relationships
4. Mechanical Knowledge Test - Form X-3; 1943
Part I - Tool Relationships
5. Electrical Knowledge Test - Form X-2; Fleet Edition, 1945

Number of items: Sixty items.

Time limits: Fore-exercise 2 minutes
Test proper 11 minutes approximately (all subjects were given time to complete all items)

Scoring method: Score is number of items correct. Scoring formula: $S = R$.

Frequency chart: Class interval of 3, N = 334.

Score	From	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57
	To	17	20	23	26	29	32	35	38	41	44	47	50	53	56	59
Frequency	f	1	1	5	10	19	26	43	44	47	43	30	20	25	17	3

Test reliability: $R_{11} = .86$.

TEST 32

ELECTRICAL EXPERIENCE

The items for this test were taken from the same United States Navy tests listed in the preceding test, Mechanical Experience.

Number of items: Sixty items.

Time limits: Fore-exercise 2 minutes
Test proper 12 minutes approximately (all subjects were given time to complete all items)

Scoring method: Score is number of items correct. Scoring formula: $S = R$.

Frequency chart: Class interval of 3, $N = 329$.

Score	From	18	21	24	27	30	33	36	39	42	45	48	51	54	57
	To	20	23	26	29	32	35	38	41	44	47	50	53	56	59
Frequency	f	2	2	8	27	31	41	60	46	34	35	22	14	6	1

Test reliability: $R_{11} = .85$.

UNCLASSIFIED

UNCLASSIFIED